भारतीय मानक
Indian Standard

IS 17190 : 2020

टाईलों और पत्थरों के जोड़ों को भरने के लिए ग्राउट — विशिष्टि

Grouts for Filling of Joints of Tiles and Stones — Specification

ICS 91.100.10; 91.100.23

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भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

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Flooring, Wall finishing and Roofing Sectional Committee, CED 05

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Flooring, Wall finishing and Roofing Sectional Committee had been approved by the Civil Engineering Division Council.

This standard specifies the requirements of different types of tile grouts suitable for filling of joints between tiles and stones of different porosity on various substrates.

Tile grouts are classified in five types based on their performances and chemical nature of their binders:

a) Cementitious grout (Type CG1),
b) Cementitious grout (Type CG2),
c) Reaction resin grout (Type RG1),
d) Reaction resin grout (Type RG2), and
e) Modified resin grout (Type MRG).

The types have specific characteristics in terms of application properties and final performance.

Grout supplied in accordance with this standard, when mixed and spread in accordance with the manufacturer's instructions, shall be suitable for the practical process of those types of tile/stone for which they are recommended by the engineer.

The manufacturer of the grout products shall give all the information necessary for filling of grout, such as surface preparation, mixing of grout, application of grout and cleaning the grouted surfaces. The manufacturer's instructions for all the above shall be carefully followed while using the grout products. All the tools and accessories used for the mixing and application of grouts shall be stored properly, and cleaned thoroughly with clean water or any other cleaner as specified by the manufacturer.

In the formulation of this standard, assistance has been derived from the following standards:

> ISO 13007-3 : 2010 Ceramic tiles — Grouts and adhesives — Part 3: Terms, definitions and specifications for grouts
>
> ISO 13007-4 : 2013 Ceramic tiles — Grouts and adhesives — Part 4: Test methods for grouts

The composition of the Committee responsible for the formulation of this standard is given in Annex H.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*).'

Indian Standard

GROUTS FOR FILLING OF JOINTS OF TILES AND STONES — SPECIFICATION

1 SCOPE

This standard specifies the requirements and test methods for grouts used for filling of joints between tiles, stones and mosaics for internal and external installations on floors and walls.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encourages to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1727 : 1967	Methods of tests for pozzolanic materials (*first revision*)
9459 : 1980	Specification for apparatus for use in measurement of length change of hardened cement paste, mortar and concrete
10078 : 1982	Specification for jolting apparatus used for testing cement
15477 : 2019	Adhesives for use with ceramic, mosaic and stone tiles — Specifications (*first revision*)

3 DEFINITIONS

For the purpose of this standard, following definitions shall apply.

3.1 Abrasion Resistance — Resistance of grout to wear.

3.2 Additional Characteristics — Characteristics for specific service conditions where enhanced levels of performance are required.

3.3 Application Methods — Method for filling the joints between tiles and cleaning the tiles.

3.4 Cementitious Grout — Mixture of hydraulic binding agents, aggregates, inorganic and organic additives, which can be mixed with water or liquid admix just before use. Grouts meeting this specification may or may not contain polymers.

3.5 Chemical Resistance — Resistance of grout to chemical agents. Characteristics of chemical resistance or limit values of chemical agents shall be specified by the buyer for their special requirements, if any.

3.6 Compressive Strength — Resistance of the grout to failure under compression exerted on two opposite points.

3.7 Deformability — Resistance of hardened grout to be deformed by stresses between the tiles without damage to the installed surface/tile.

3.8 Final Cleaning Time — Time interval between filling the joints with grout and starting to clean the tiles/stones for the second time.

3.9 Flexural Strength — Resistance of the grout to failure under flexure applied at three points.

3.10 Grouting Time — Minimum time interval after installation of tiles/stones, after which the grout can be applied to the joints.

3.11 Initial Cleaning Time — Time interval between filling the joints with grout and starting to clean the tiles/stones.

3.12 Linear Shrinkage — Reduction in length of a grout during hardening.

3.13 Liquid Admix (*Latex Additive*) — A special aqueous polymer dispersion to be mixed with a cementitious grout on site.

3.14 Modified Resin Grout — A single or multi-component mixture of binder, aggregates, inorganic and/or organic additives in which hardening occurs by chemical reaction or air curing.

3.15 Pot Life — Maximum time interval during which the grout can be used after mixing.

3.16 Reaction Resin Grout — A single or multi-component mixture of synthetic resin, aggregates, inorganic and/or organic additives in which hardening occurs by chemical reaction.

3.17 Service Time — Minimum time after which the grouted tile/stone installation can be put to use. Manufacturer shall define the service times for various types of traffic conditions.

3.18 Shelf Life — Time of storage under stated conditions during which a grout/liquid admix may be expected to maintain its working properties.

3.19 Slaking Time (*Maturing Time*) — Interval between the time when the grout is mixed and the time when it is ready for application.

3.20 Tile Grout — Any suitable product used to fill the joints between various types of tiles and stones with the exception of movement joints and expansion joints.

3.21 Transverse Deformation — Deflection recorded at the center when a beam of hardened grout is subjected to three-point loading.

3.22 Wall and Floor Tiles — Tiles made of materials such as ceramic, vitrified, glass, porcelain, metal, concrete, cement, natural and engineered (agglomerated) stones.

3.23 Water Absorption — Amount of water absorbed by capillary action when the grout surface is in contact with water without any additional pressure.

4 CLASSIFICATION

4.1 Cementitious Grout (Type CG1)

Grout made up of a mixture of cement, with or without graded sand and additives that provide water retentivity, uniformly colored material and meet the requirements given in Table 1. These are used for filling joints having widths up to 5 mm from grouts made without graded sand, and for joints having widths up to 12 mm from grouts made with graded sand.

4.2 Cementitious Grout (Type CG2)

Grout made up of a mixture of cement, with or without graded sand, and other ingredients including re-dispersable, latex/polymer powder (to which only water is added at the job site) or a liquid latex mixture that provide water retentivity, uniformly colored material and meet the requirements given in Table 1. In latex form, it is added as a replacement for part or all of the mixing water. These are used for filling joints having widths up to 5 mm from grouts made without graded sand, and for joints having widths up to 12 mm for grouts made with graded sand.

4.3 Reaction Resin Grout (Type RG1)

Grout made up of resin composition, essentially a 100 percent solid system, that is supplied in two or more parts to be mixed immediately before used for filling joints, and after application, suitable cleaner is used in order to expedite cleaning from the surfaces before the product hardens; and shall meet the requirements given in Table 1.

4.4 Reaction Resin Grout (Type RG2)

Grout made up of resin composition, not essentially a 100 percent solid system, that is supplied in two or more parts to be mixed immediately before used for filling joints and that is partially emulsified by water, after application, in order to expedite cleaning from the surfaces during application before the product hardens and shall meet the requirements given in Table 1.

4.5 Modified Resin Grout (Type MRG)

Grout made up of materials other than cement, and not covered by Type RG1 or Type RG2 and shall meet the requirements given in Table 1. These are used for filling of joints of width up to 12 mm. These special grouts may belong to resin and modified resin family with additional requirement of deformability which qualifies this grout for highly demanding and flexible substrates like exterior applications.

5 REQUIREMENTS

Grouts shall comply with the requirements given in Table 1.

6 PACKING

Grout shall be suitably packed in leak proof and moisture proof bags or containers, and liquid admixture/liquid components of grouts shall be bottled in suitable leak proof and moisture proof containers.

7 MARKING

7.1 The bags or liquid container shall be marked indelibly with the following:

a) Name of the product;
b) Manufacturer's mark and place of origin;
c) Date or code of production, shelf life and conditions of storage;
d) Type of grout; and
e) Instructions for use:
    1) Mix proportions, if applicable;
    2) Maturing time, if applicable;
    3) Pot life;
    4) Mode of application;
    5) Delay for cleaning and service time, if applicable; or
    6) Field of application.

NOTE — In the designation of a grout, information about special properties can be included when the product is intended for use in specific applications. This information shall be marked on the packaging or provided in the technical data sheet/test certificate along with the product.

Table 1 Requirements for Grouts

(*Clauses* 4.1, 4.2, 4.3, 4.4, 4.5 *and* 5)

Sl No.	**Characteristic**	**Requirements**					**Method of Test, Ref to**
		Type CG1	Type CG2	Type RG1	Type RG2	Type MRG	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Linear shrinkage, percent, *Max*	0.30	0.20	0.15	0.15	N.A.	Annex B
ii)	Water absorption after 30 min, percent, *Max*	15	10	0.5	0.5	5	Annex C
iii)	Water absorption after 240 min, percent, *Max* (optional)	*see* Note 1	*see* Note 1	*see* Note 1	*see* Note 1	*see* Note 1	Annex C
iv)	Compressive strength, MPa, *Min*	15	17	45	20	15	Annex D
v)	Flexural strength, MPa, *Min*	2.5	3	30	12	5	Annex D
vi)	Abrasion resistance, percent, *Max*	3.0	2.5	0.5	0.5	2.5	Annex E
vii)	Chemical resistance (optional)	N.A.	N.A.	*see* Note 2	*see* Note 2	*see* Note 2	Annex F
viii)	Transverse deformation, mm, *Min*	N.A.	N.A.	N.A.	N.A.	2.5	Annex G

NOTES

1 Limits of water absorption after 240 min may be decided by mutual agreement between the manufacturer and the purchaser.

2 Limits of chemical resistance against specific chemical agents may be decided by mutual agreement between the manufacturer and the purchaser.

7.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

ANNEX A

(B-1, C-1, D-1, E-1, E-3, F-1 *and* G-1)

SAMPLING AND MIXING PROCEDURE

A-1 SAMPLING

A representative sample of at least 2 kg shall be used.

A-2 CONDITIONING

Condition all the test materials, including water, for at least 24 h under standard conditions, that is, at a temperature of 27 ± 2 °C and a relative humidity of 65 ± 5 percent. Unless otherwise stated, all tests shall be carried out under standard conditions only.

A-3 MIXING PROCEDURE

A-3.1 Cementitious Grout

Add the potable water/liquid admix in the ratio designated by the grout manufacturer to the mixing bowl, start mixing and add the entire grout powder to the mixer (conforming to the requirements for mixer given in IS 1727) within 15 s. Mix for an additional 15 s, stop and scrape down the bowl and the paddle, and mix for an additional 60 s to obtain a workable mix with complete and visually uniform wetting of the grout powder. Slake for the amount of time recommended by the manufacturer and after slaking, mix for an additional 15 s. Mixed grout shall not be used after 1 hr unless otherwise stated by the manufacturer.

The resulting grout shall be workable and free of lumps, but possess enough consistency so that, where taken from the container, it will hang on a margin trowel.

A-3.2 Reaction Resin Grout

Blend the parts supplied using a suitable hand tool or machine mixer as per the manufacturer's directions for mixing, making sure all the dry ingredients are thoroughly and uniformly wetted.

A-3.3 Modified Resin Grout

The manufacturer's instructions of mixing and application shall be followed and shall meet the requirement of clean ability, as defined by the manufacturer.

ANNEX B

(*Table* 1, *Annex* C *and Annex* D)

DETERMINATION OF LINEAR SHRINKAGE

B-1 Linear shrinkage shall be tested following the general test conditions and procedures given in Annex A and the instructions given below.

B-2 APPARATUS

B-2.1 Three Gang Moulds, used to prepare prismatic specimens (40 ± 0.1) mm × (40 ± 0.1) mm × (160 ± 0.4) mm, with ground surfaces, made of steel (*see* Fig. 1). Holes for fitting suitable pins shall be pierced into the sides of the moulds corresponding to the ends of test specimens.

Six smooth inserts: rigid, non-absorbent frames, such as polyethylene or polytetrafluoroethylene (PTFE), with dimensions of (40 ± 0.1) mm × (160 ± 0.4) mm and thickness of (15 ± 0.1) mm.

B-2.2 Jolting Apparatus, or Jolting Table, as per IS 10078.

B-2.3 Measuring Apparatus, as per IS 9459.

B-2.4 Calibration, Rod or Reference Rod, used as a standard length against which gauge readings can be tested. The rod shall be made of material having a negligible coefficient of expansion.

B-3 PREPARATION OF TEST SPECIMENS

Assemble suitable mould to prepare samples. Mould the specimens immediately after the mixing of the grout as per Annex A, with the mould firmly clamped to the jolting table. Introduce, using a suitable scoop, the first of two layers of grout into each of the compartments, directly from the mixing bowl. Spread the layer uniformly, then compact using 60 jolts. Introduce the second layer of grout, level and compact with a further 60 jolts. Lift the mould gently from the jolting table, strike off excess material and smooth the surface with a flat trowel. Wipe off the grout left on the perimeter of the mould. Place a 210 mm × 185 mm plate glass sheet of 6 mm thickness on the mould. A plate of steel or other impermeable material of similar size may be used. Place the mould, suitably identified, on a horizontal base under standard conditions. After 24 h, carefully remove the specimens from the mould. Prepare three specimens for each grout.

B-4 TEST PROCEDURE

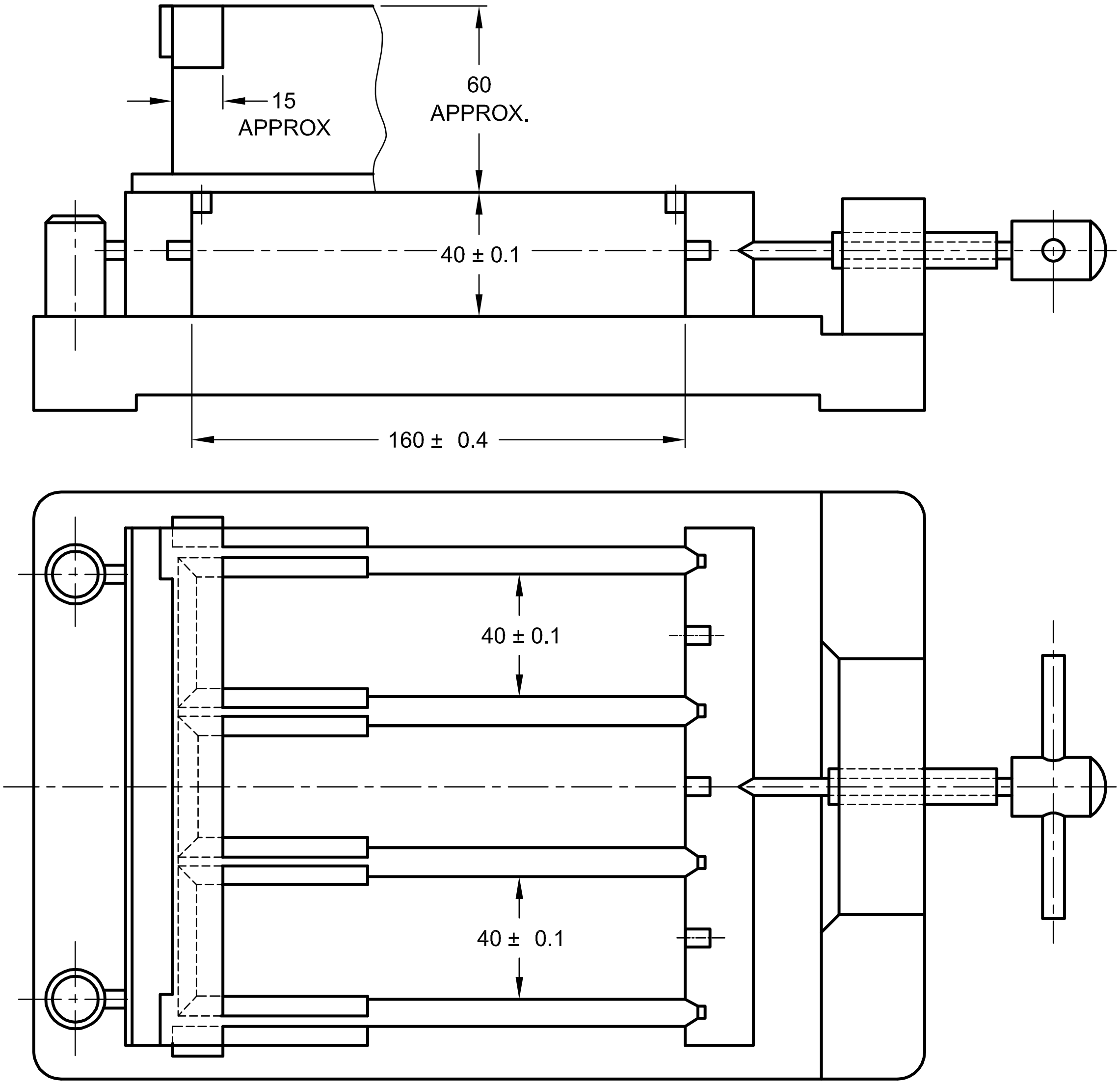
Immediately after de-moulding, determine the length, L_0 of the test samples using the measuring apparatus. Keep the de-moulded prisms on a 10 mm dimension under standard conditions leaving a clearance of at least 25 mm between specimens. Take a reading of each specimen, L_1 after 27 days ± 12 h from the initial reading.

B-5 EVALUATION OF RESULTS

Calculate the linear shrinkage (in percent), as given below:

Linear shrinkage (percent) = $(L_0 - L_1)/L_0 \times 100$

Report the individual and mean linear shrinkage (in percent) of the three specimens, correct to nearest 0.01 percent.



All dimensions in millimetres

FIG. 1 Typical Mould for Prismatic Specimens (40 × 40 × 160)

ANNEX C

(*Table* 1)

DETERMINATION OF WATER ABSORPTION

C-1 Water absorption shall be tested following the general test conditions and procedures given in Annex A and the instructions given below.

C-2 APPARATUS

C-2.1 Gang Moulds, as described in **B-2.1**.

C-2.2 Three Inserts, 1 mm thick, of rigid plastic (for example, PTFE) or high density polyethylene (HDPE) with no release agent.

C-2.3 Jolting Apparatus, or Jolting Table, as per IS 10078.

C-2.4 Tray, with a flat base large enough to contain three test specimens.

C-3 PREPARATION OF TEST SPECIMENS

Place the inserts approximately in the middle of the mould, parallel to the smaller faces. Following the procedure described in **B-3**, prepare six specimens of each grout. After demoulding, condition the samples for 20 days under standard conditions. Seal the four sides with dimension 40 mm × 80 mm by means of a neutral curing silicone sealant such that they are water impermeable. Then condition the samples for 7 additional days.

C-4 TEST PROCEDURE

Twenty eight days after mixing, weigh each test sample to the nearest 0.1 g, m_0 and then place them vertically in the tray, with the unsealed surface down on round or triangular spacers with dimension 40 mm × 40 mm, immersed in water, 5 mm to 10 mm deep, taking care to prevent the prism faces from coming in contact with each other. Maintain the water level constant by adding water when necessary. After 30 min, remove the test samples from water, quickly dry them by blotting with a dampened cloth and immediately weigh to the nearest 0.1 g, m_1. Replace in the tray and repeat the procedure after an additional 210 min, if required.

C-5 EVALUATION AND EXPRESSION OF RESULTS

Calculate the water absorption (in percent), as given below:

$$\text{Water absorption (percent)} = (m_1 - m_0)/m_0 \times 100$$

Report the individual and mean water absorption (in percent) of the six specimens, correct to nearest 0.01 percent.

ANNEX D

(*Table* 1)

DETERMINATION OF FLEXURAL AND COMPRESSIVE STRENGTH

D-1 Flexural and compressive strength shall be tested following the general test conditions and procedures given in Annex A and the instructions given below.

D-2 APPARATUS

D-2.1 Gang Moulds, as described in **B-2.1**.

D-2.2 Jolting Apparatus or Jolting Table, as per IS 10078.

D-2.3 Testing Machine, of flexural strength type, capable of applying the load with suitable capacity and sensitivity for the test. The machine shall be provided with a flexure device as shown in Fig. 2.

D-2.4 Testing Jig, as shown in Fig. 3, incorporated in the lower platen; the upper platen receives the load from the compressive strength testing machine through an intermediate spherical seating.

D-3 PREPARATION OF TEST SPECIMENS

Following the procedure described in **B-3**, prepare three specimens of each grout.

D-3.1 Flexural Strength Under Standard Conditions

Keep the de-moulded prism in standard conditions for 27 days leaving a clearance of at least 25 mm between prisms. After conditioning has been completed, place the prism in the testing machine (*see* **D-2.3**) with one side face on the supporting rollers and with the longitudinal axis normal to the support. Apply the load vertically by means of the loading roller to the opposite side face of the prism and increase it smoothly at the rate of 50 ± 10 N/s until fracture. Keep the prism halves in standard conditions until tested in compression.

D-3.2 Compressive Strength under Standard Conditions

Test the prism halves broken in flexure, by means of the equipment given in **D-2.4**. Centre the prism halves laterally to the platens of the machine within ± 0.5 mm, and longitudinally, such that the end face of the prism overhangs the platens or auxiliary plates by about 10 mm. Increase the load smoothly at the rate of (2 400 ± 200) N/s over the entire load application until fracture.

D-4 EVALUATION OF RESULTS

D-4.1 Flexural Strength

The flexural strength, L_f, is calculated using equation given below:

$$L_f = (1.5\, P_f \times L)/b^3 \text{ MPa}$$

where

b = length of the side of the square section of the prism, in mm;

P_f = load applied to the middle of the prism at fracture, in N; and

L = distance between the supports, in mm.

Report the individual and mean flexural strength of the three specimens, correct to nearest 0.1 MPa.

D-4.2 Compressive Strength

The compressive strength, L_c, is calculated using equation given below:

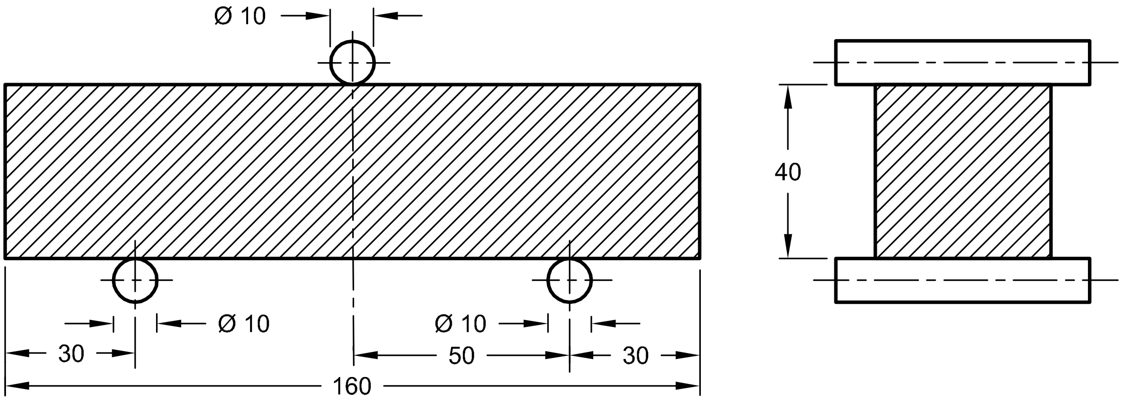
$$L_c = P_c/\text{A MPa}$$

where

P_c = maximum load at fracture, in N; and

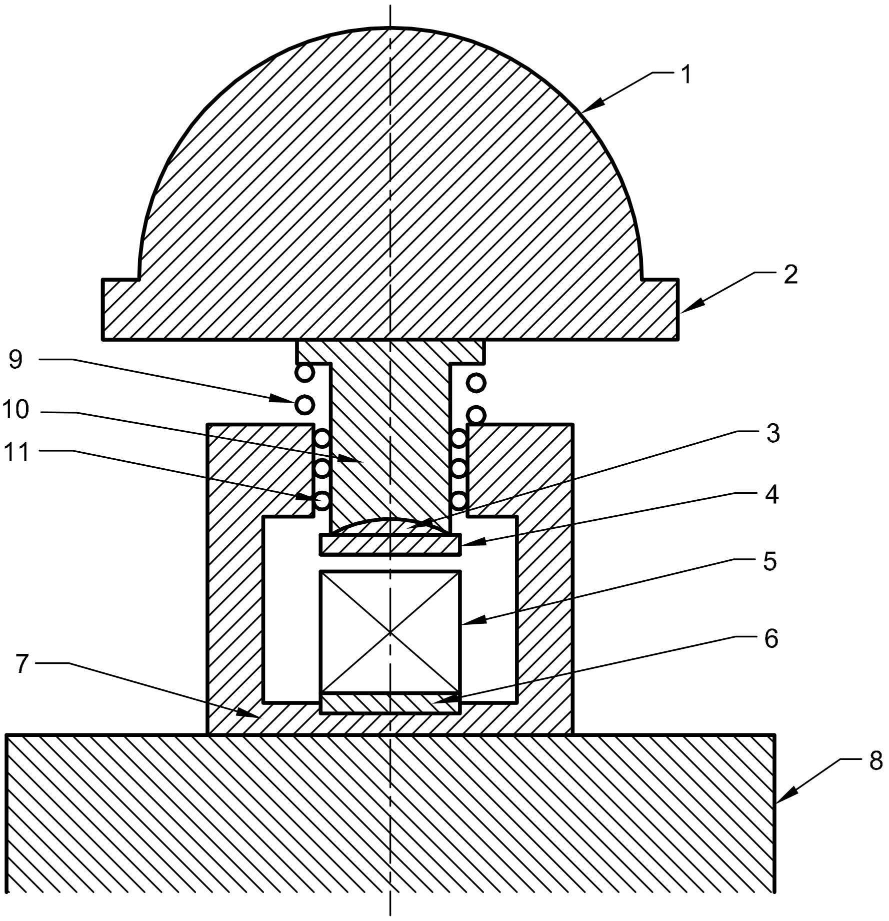
A = cross sectional area of the specimen, in mm^2

Report the individual and mean compressive strength of the six specimens, correct to nearest 0.1 MPa.



All dimensions in millimetres

FIG 2. TYPICAL ARRANGEMENT OF LOADING FOR FLEXURAL STRENGTH TESTING



KEY

1 – SPHERICAL SEATING OF MACHINE
2 – UPPER PLATEN OF THE MACHINE
3 – SPHERICAL SEATING OF JIG
4 – UPPER PLATEN OF THE JIG
5 – SPECIMEN
6 – LOWER PLATE
7 – LOWER PLATEN OF THE JIG
8 – LOWER PLATEN OF THE MACHINE
9 – RETURN SPRING
10 – SLIDING ASSEMBLY
11 – BALL BEARINGS

Fig 3. Typical Jig for Compressive Strength Testing

ANNEX E

(*Table* 1)

DETERMINATION OF RESISTANCE TO ABRASION

E-1 Resistance to abrasion shall be tested following the general test conditions and procedures given in Annex A and the instructions given below.

E-2 APPARATUS REQUIRED

Abraser (single head or double head) as shown in Fig. 4 and Fig. 5 or equivalent model with roller wheels, supplementary weights, precision balance, vacuum suction portion, cleaner brush, screw driver for specimen platform.

E-3 PROCEDURE

Prepare the specimen having 125 mm diameter and thickness of 6 ± 1 mm with the grout mix conditioned and prepared as per Annex A. Cure them under standard laboratory conditions for a period (28 days in case of cementitious grouts) specified in technical data sheet of the grout for full curing. The samples should be conditioned to the testing atmosphere for at least 24 h (48 h, in case of organic materials).

Take at least 3 samples, duly cleaned by brush. Weigh the samples before starting the test as pre-weight, *A*. Switch on the machine and auxiliary vacuum unit and adjust precision vacuum nozzle. Keep the abrading wheel on the abrading arm. For grout and its products, H-18 calibrade or equivalant wheels should be used. Put the machine on refacing mode. For new rollers, run 50 refacing cycles 2 times, and for old rollers, run 25 cycles, if the last completed cycles were less than 1 000, else run for 50 refacing cycles. S11 refacing sheet or equivalant sheet should be used for the refacing activities. Put the machine in testing mode before starting the test.Keep the samples tightly in the specimen holder using bolts. Set the speed at 60 rpm for effective abrasion and the number of abrasion cycles at 300. Press start button for the testing. If the abraser is double header, both the abrasion heads may be used at the same time. Ensure the vacuum unit is working with the test. This will help to take away the abraded mass from the surface. After completing the test, demount the samples from the surface. Weigh the samples again with precision balance, *B*. Before weighing make sure all the powder particles were cleaned from the specimen surface.

E-4 CALCULATION

Calculate the percentage weight loss using the weight difference between initial and final weight of the sample, as given below:

Percent weight loss (after 300 cycles) = $(A-B)/A \times 100$

where

A = initial weight of the sample; and

B = final weight of the sample.

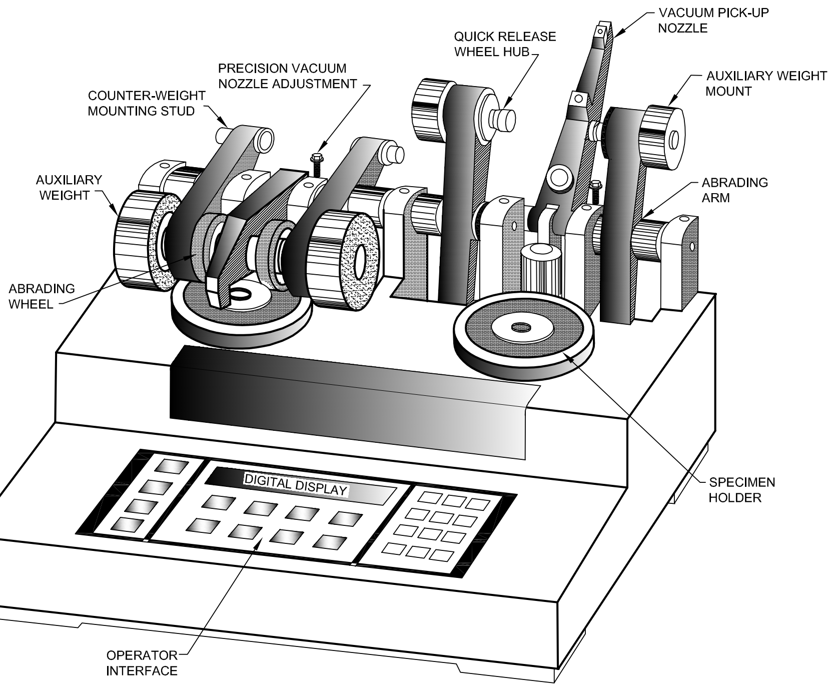


FIG. 4 TYPICAL ABRASER

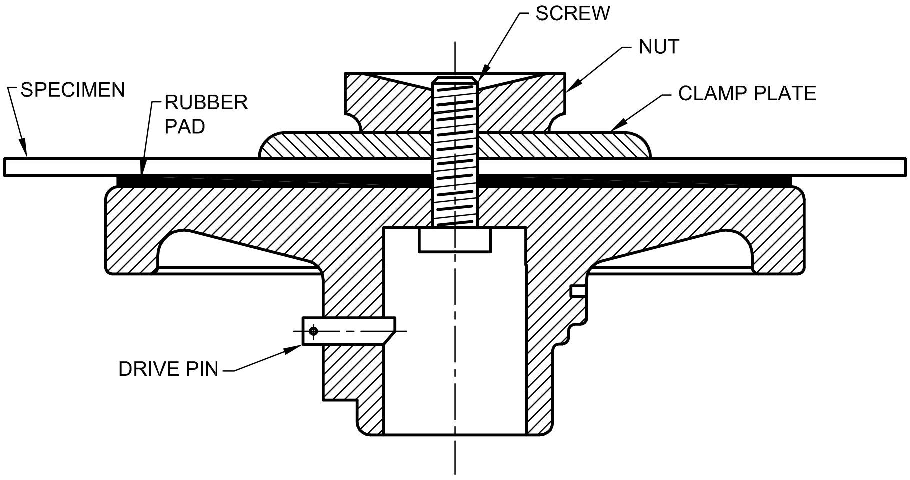


FIG. 5 TYPICAL CROSS – SECTION OF SPECIMEN HOLDER

ANNEX F

(*Table* 1)

DETERMINATION OF CHEMICAL RESISTANCE

F-1 Chemical resistance shall be tested following the general test conditions and procedures given in Annex A and the instructions given below.

F-2 APPARATUS

F-2.1 Cylindrical Mould, 25 ± 1 mm in diameter by 25 ± 1 mm high. The moulds may be constructed in any manner that allows the formation of the desired test specimen. The material from which the mould is constructed shall be chemically inert and shall have anti-stick properties.

F-2.2 Containers

F-2.2.1 *Wide Mouth Jars*, of sufficient capacity, fitted with plastic or plastic-lined metal screw caps for low temperature tests involving media of low volatility.

F-2.2.2 *Erlenmeyer Flasks*, of sufficient capacity, fitted with standard taper joints and a reflux condenser attachment for use with volatile media.

F-2.2.3 *Compression Testing Machine*

F-2.2.4 *Chemical Agents,* consisting of the media to which the materials are to be exposed in service.

F-3 TEST SPECIMENS

F-3.1 Number

The number of specimens shall consist of sets of a minimum of three cylinders for one medium, at a single temperature and for each test interval. In addition, one set of at least three specimens shall be available for test immediately following the conditioning period, and other sets of at least three, equivalent to the number of test temperatures, for the total test period.

F-3.2 Preparation

Mix the components in the ratio specified by the manufacturer’s instructions. Blend the parts using a suitable hand tool or machine mixer, making sure any ingredients are thoroughly and uniformly mixed.

F-3.3 Conditioning

Condition the test units for 7 days in standard conditions, the 7 days include the curing time in the mould. After the 7 days, proceed as described in **F-3.5** on one set of specimens.

F-3.4 Procedure

Immediately following the conditioning period, measure the diameter of all test specimens to the nearest

0.03 mm using a micrometer, D_1. Make two measurements at right angles to each other and record the diameter as the average of the two. Following the diameter measurement, weigh all the specimens to the nearest 1 mg on an analytical balance and record the values, m_1. Prior to immersion, record a brief description of the colour and surface appearance of the specimen and of colour and transparency of the test medium. Place the weighed specimens, to be immersed, on their curved sides in the individual containers.

Add sufficient chemical agent to continuously cover each specimen by a minimum 10 mm. Place the closed container in a constant temperature oven adjusted to the required temperature or in a suitable adjusted liquid bath simulating the real service and exposure as closely as possible. Replace agents that are known to be unstable, as often as necessary, in order to maintain the original chemical composition and concentration, for the planned intervals.

Remove the specimen after 28 days of immersion to determine the chemical attack. Other exposure periods may be employed. Clean each specimen by three quick rinses in running cold tap water and quick dry by blotting with a paper towel between each rinse. After the final blotting allow the specimen to dry for 30 min, resting on its curved surface, and weigh to the nearest 1 mg, m_2 and measure the diameter, D_2 of the test specimen as described in **F-3.5**. Note any indication of surface attack on the specimen, any discoloration of the test specimen and the formation of any sediment in the chemical agent.

F-3.5 Determination of the Compressive Strength for One Set of Specimens

Determine the compressive strength for one set of specimens:

a) Immediately after the conditioning period, C_1;

b) After the exposure period for each chemical agent and each temperature, C_2; and

c) After ageing in air for the total test period at each test temperature.

The elapsed time between the removal of each specimen from the test medium and the compressive test should be uniform for all specimens. Place each specimen in the testing machine such that the plane faces of the cylinder are in contact with the surface of the compression tool or cage. Apply the load to the specimen at a cross-head movement of 5.5 ± 0.5 mm/min when the machine is running without load. Break the specimen and record the maximum load.

F-3.6 Evaluation and Expression of Results

F-3.6.1 *Mass Change*

Calculate the loss or gain in mass of the specimen during exposure for each examination period, as given below:

$$\Delta m = (m_2 - m_1)/ m_1 \times 100$$

where

Δm = mass fraction change, to the nearest 0.01 percent;

m_1 = mass of the specimen after initial conditioning, in g; and

m_2 = mass of the specimen after immersion, in g.

Determine the mean of the three values or more.

F-3.6.2 *Diameter Change*

Calculate the change of the diameter of the specimen during exposure for each examination period, as given below:

$$\Delta D = (D_2 - D_1)/D_1 \times 100$$

where

ΔD = diameter change, to the nearest 0.01 percent;

D_1 = diameter of the specimen after the initial conditioning, in mm; and

D_2 = diameter of the specimen after the exposure period, in mm.

Determine the mean of the three values or more.

F-3.6.3 *Change of Compressive Strength*

Calculate the cross-sectional area of the specimen on the diameter value as determined in **F-3.4**. Calculate the percentage change in compressive strength of the specimen during exposure for each examination period, as given below:

$$\Delta C = (C_2 - C_1)/C_1 \times 100$$

where,

ΔC = compressive strength change, to the nearest 0.01 percent;

C_1 = load per cross-sectional area of specimen after conditioning period, in MPa; and

C_2 = load per cross-sectional area of specimen after exposure period, in MPa.

NOTE — A result showing a plus (+) sign in the values of Δm, ΔD *and* ΔC shall indicate a gain in mass, diameter and compressive strength respectively and *vice-versa*.

F-3.6.4 For each exposure period, the following information shall be reported:

a) Mean percentage of mass change of specimen;
b) Mean percentage of diameter change;
c) Appearance of specimen after immersion (surface cracks, loss of gloss, etching, pitting, softening, etc.);
d) Appearance of the test chemical agent (discolouration, sediment, etc);
e) Mean percent change in the compressive strength of specimen;
f) Test conditions of exposure to each chemical agent, frequency of change of chemical agent, concentration, temperature, etc;
g) Colour and surface appearance of test units before and after testing; and
h) Total duration of the test and the exposure periods, in days.

ANNEX G

(*Table* 1)

DETERMINATION OF TRANSVERSE DEFORMATION

G-1 Transverse deformation shall be tested following the general test conditions and procedures given in Annex A and the instructions given below.

G-2 APPARATUS

As per **F-1** of IS 15477.

G-3 TEST SPECIMENS

As per **F-2** of IS 15477, substituting grout for adhesive.

G-4 PROCEDURE

G-4.1 Conditioning

Immediately after the removal of template B place five specimens, on the support, horizontally into the plastic container and seal it to make it air tight. Condition the test units at 27 ± 2 ºC. After fourteen days remove them from the plastic container and condition them for another fourteen days in air in standard conditions.

G-4.2 Transverse Deformation, as per **F-3.2** of IS 15477.

G-5 TEST RESULTS

The transverse deformation is determined correct to 0.1 mm, by calculating the average value of the deformations. Deformation, in mm, shall be reported for individual and mean values for deformability of grout. The grout deformability is classified as ‘*S1*’ if the mean value is more than or equal to 2.5 mm.

ANNEX H

(Foreword)

COMMITTEE COMPOSITION

Flooring, Wall finishing and Roofing Sectional Committee, CED 05

Organization	*Representative(s)*
In Personal Capacity (*L/109, Sarita Vihar, New Delhi*)	Shri Ashok Khurana (***Chairman***)
ArdexEndura India Pvt Ltd, Bengaluru	Shri K. P. Paulson Shri Gopinath Krishnan (*Alternate*)
ACC Limited, Mumbai	Representative
Ahluwalia Contracts India Limited, Mumbai	Representative
Building Materials & Technology Promotion Council, New Delhi	Shri S. K. Gupta Shri Pankaj Gupta (*Alternate*)
Carborundum Universal Ltd, Chennai	Shri Ranji Varghese Shri V. G. Rajendran (*Alternate*)
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Construction Industry Development Council, New Delhi	Shri P. R. Swarup Shri Ravi Jain (*Alternate*)
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CSIR-Central Glass and Ceramic Research Institute, Kolkata	Dr Satyendra Nath Misra
CSIR-Central Road Research Institute, New Delhi	Dr Rakesh Kumar
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Modern Tiles & Marble, New Delhi	Shri Subhash Kapoor E. R. Padma Kumar (*Alternate*)
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